**Madison Water Utility**
**Lake View Reservoir Replacement Project**
**Wisconsin PSC Project Approval Documentation**
**January 16, 2015**

## PROJECT DESCRIPTION

The 55,000 gallon Lake View Reservoir was constructed in 1938 to provide water service to the Lake View Hill Sanatorium. In 1938 the reservoir was filled by a well located at the site. Madison Water Utility (MWU) assumed ownership of the facility in the late 70's and has been operating and maintaining the reservoir since that time. The well was abandoned in the 70's when MWU assumed ownership. Reservoir 113 is filled by a pumping station that draws water from the MWU system. Reservoir 113 provides water storage and fire protection to the Lake View Hills Neighborhood and Dane County Department of Human Services facility (Pressure Zone 5).

In the 2006 Water Master Plan, MWU determined that both Pressure Zone 5 and Pressure Zone 6 are lacking water storage capacity for residential, commercial and institutional areas on the north side of the City of Madison. This deficiency impacts the fire flow capacity and the emergency backup water supply to the area. Pressure Zone 5 and the part of Pressure Zone 6E in the north end of the City of Madison currently do not meet the minimum level of service established by MWU.

The project being proposed is the construction of a new dual-tank water tower consisting of a cylindrical, 1-million gallon capacity Zone 6E storage tank at the base of the structure and a smaller 300,000 gallon Zone 5 tank at the top of the structure. The dual reservoir will replace the existing 55,000 gallon water tower on the same site. The proposed Zone 5 upper reservoir will have the same overflow elevation of 1140 as the existing tank. The new tank will be constructed of welded steel plate with associated appurtenances. The goal of this project is to improve system fire protection capacity, emergency water supply capacity, and overall system reliability within Pressure Zones 5 and 6E.

### Project Location:

1202 Northport Drive (Lake View Park), Madison, WI 53704. The reservoir and pump station are located on property that the Madison Water Utility uses under a permanent easement with Dane County.

South 1/2 of Section 25 Town 8 North Range 9 East

The proposed reservoir location will be on the same easement as the existing elevated steel tank. It is located on an elevated tree covered hill adjacent to – "Lake View Hill Park" (Dane County Park System) and the Dane County Department of Human Services facility. The lot is north of Northport Drive near the west end of Lake View Avenue. The existing and proposed towers have a base elevation of 1015.

**Specific Project Information:**

- Capacity:
  - Upper reservoir: 300,000 gallons
  - Lower reservoir: 1,000,000 gallons
- Pressure Range:
  - Zone 5 (Lake View Zone): 45 - 90 psi
  - Zone 6E (Main Zone): 35-100 psi
- Elevation at Overflow or High Water Line:
  - Upper Reservoir: 1140 ft
  - Lower Reservoir: 1085 ft
- Elevation at Bottom Water Line:
  - Upper Reservoir: 1120 ft
  - Lower Reservoir: 1015 ft
- Head Range:
  - Upper Reservoir: 20 ft
  - Lower Reservoir: 70 ft
- Height from top of foundation to high water level:
  - Upper Reservoir: 125 ft
  - Lower Reservoir: 70 ft
- Elevation at Top of Foundation: 1015 ft
- Finished ground surface at foundation: 1014.25 ft
- Tank Diameter:
  - Upper Reservoir: 59 ft
  - Lower Reservoir: 52 ft

**SCHEDULE OF CONSTRUCTION**

Construction of the water system improvements is expected to be as follows:

| **Description** | **Milestones** |
|---|---|
| Final Design | January-July, 2014 |
| Bidding Process for Two Tank Options | August, 2014 |
| Award Construction Project/Execute Contracts | February, 2015 |
| Final Shop Drawing Review | March, 2015 |

| **Description** | **Milestones** |
|---|---|
| Demolition of Existing Tower | April, 2015 |
| Concrete Foundation | May, 2015 |
| Steel Tank Erection | June/November, 2015 |

| **Description** | **Milestones** |
|---|---|
| Steel Tank Painting and Final Landscaping | May/July, 2016 |
| Disinfection and Filling – Fully Operational | July 2016 |
| Cell Carrier Installation | July/August 2016 |

## PURPOSE AND NECESSITY OF PROJECT

**Existing Tower Evaluation:** The existing 1938 water tower has reached the end of its lifespan and is does not meet current system requirements for volume/fire protection.

**Supply and Storage Water System Evaluation:**
The 2006 MWU Water Master Plan determined that Pressure Zone 6E currently has a storage deficiency and insufficient fire flow capacity. Additionally, Pressure Zone 5 lacks sufficient fire flow capacity in both the residential and commercial/institutional areas – this is largely due to existing limited reservoir storage volume. The East Side Water Supply project, completed in 2011/2012, once again validated the need for additional storage within Zone 6E on Madison's north side.

## ANALYSIS AND DESCRIPTION OF ALTERNATIVES TO THE PROJECT

The Engineer reviewed the findings of the Investigations mentioned above and compared advantages and disadvantages of each alternative.

### Alternatives

**New Two Zone (Dual Tank) Steel Tank**
This alternative consists of two separate tanks contained within a single tower structure that will provide water to both Pressure Zones 5 and 6E. The estimated total capital costs associated with this structure is valued at approximately $5.5 million. This cost includes equipment costs provided by vendors, structure costs, costs associated with upgrades to the site, and any existing facilities to accommodate the reconstruction project, engineering costs and associated contingency allowances.

Hydraulically, this tank would satisfy storage capacity deficiencies identified for both Zone 5 and Zone 6E on the north side of the Madison system.

*Advantages*
- Reliable hydraulics and fire flow volumes.
- Emergency backup water supply
- Conserves green space within Lake View Hill Park.
- This option offers the smallest final footprint.

*Disadvantages*
- Higher capital costs.
- Complex construction.

**Two Reservoirs: New 6E Reservoir and New Zone 5 Reservoir**

This alternative consists of the construction of two separate elevated reservoir structures to service Zone 5 and Zone 6E, respectively. The Zone 5 spheroid would be located at the existing site and constructed out of steel. The FAA has determined that the existing and proposed reservoir at the existing site is not a hazard to navigation with regard to the Dane County Regional Airport. It is expected that a replacement tank located on the same site would also be granted a variance by Dane County for the Height Limitation Restriction. The 300,000 gallon reservoir would provide the necessary storage capacity within the Zone 5 system and improve fire flow capacity and emergency supply.

The 1,000,000 gallon Zone 6E reservoir would have to be sited and permitted for construction as a new tower. Depending on the location of the reservoir construction and the resulting overall height the reservoir could be either steel, concrete or a combination of concrete and steel. The FAA and Dane County would have to evaluate any proposed site for impacts on air navigation around the Dane County Regional Airport. Moving closer to the airport would be problematic and difficult to permit. Other areas on the north end are either currently developed or at a lower elevation which would drive construction costs higher and be opposed by local residents and neighborhood groups. Utilizing the existing site for a second tank would result in a negative impact to the area, the Lake View Hills Park, and the Dane County Human Resources facility. It is expected that the neighborhood and Dane County would not permit a second separate reservoir on the existing site. The total capital cost for two separate reservoirs is estimated to be $4.7 million. Permitting and siting a second Zone 6E reservoir would have scheduling impacts to the project.

*Advantages*

- Slightly lower capital cost.
- Improved system hydraulics for both Zone 5 and Zone 6E
- Improved fire flow capacity.

*Disadvantages*

- Neighborhood residents overwhelmingly were not in favor of two separate tanks.
- Much larger footprint is required.
- Additional real estate in the residential neighborhood required.
- FAA and Dane County Airport approval challenges
- Increased maintenance costs for 2 separate reservoirs

**Use a Ground Level Reservoir with a Pumping Station**

This alternative consists of the construction of a single ground level reservoir to service both Zone 5 and Zone 6E. The proposed reservoir would be located at the existing site. The reservoir would have a capacity of 1,000,000 and serve Zone 6E by gravity. The 70 foot reservoir could be constructed of either concrete or steel. Zone 5 would be served by a pumping station that would provide the required pressure and water flow for both day to day demands and fire fighting capability. Reliability would have be designed into the pumping station with the use of redundant pumps and a backup generator system. It is anticipated that additional space would be required for the pumping station and generator.

The estimated capital cost for a single reservoir and a constant pressure pumping station and generator to serve Zone 5 is estimated to be $4.7 million. Annual operating costs will be higher to operate and maintain the pumping station and the generator.

The neighborhood was not in favor of using a pumping station for day to day water supply for Zone 5. The possibility of mechanical breakdown and the risks associated with relying on pumping equipment in emergency situations for a significant service area did not make this alternative attractive to local residents. Wisconsin Department of Natural Resources strongly prefers the use of gravity supply to any service area that includes more than 50 customers. Pressure Zone 5 has over 190 residential customers in addition to the Dane County Human Services campus located near the reservoir site. Additionally, it is MWU practice to provide gravity fed water storage to all pressure zones.

*Advantages*

- Slightly lower initial capital cost.
- Improved system hydraulics for both Zone 5 and Zone 6E.
- Improved fire flow capacity.

*Disadvantages*

- Neighborhood residents overwhelmingly were not in favor of relying on a pumping station for their water supply.
- Wisconsin DNR strongly recommends the provision of gravity fed storage for any service area that has more than 50 connections. Pressure Zone 5 serves over 190 residential customers and the Dane County Human Service facility at Lake View Hill.
- MWU policy and practice to provide gravity fed storage for all pressure zones would eliminate this alternative from consideration.
- System is more complex and relies on mechanical equipment.
- Additional real estate in the residential neighborhood required to expand the pumping station and provide space for generator backup.
- Increased maintenance costs due to the added complexity of the pumping station and emergency backup generator

## RECOMENDATION OF ALTERNATIVES

After considering all aspects of the available alternatives, considering neighborhood input, and taking into account MWU level of service standards, it is recommended that a new dual-zone reservoir be constructed at the Lake View location. Constructing a two zone facility at this location satisfies system needs for fire protection capacity, emergency backup water supply, and system redundancy for both Pressure Zone 5 and the northern portion of Pressure Zone 6E.

## PROJECT COST ITEMIZATION

Cost of the Project by Major Plant Accounts – The current budget for project construction is $5,500,000. Engineering costs are expected to be approximately $300,000. The following is a breakdown of the project costs per major plant account.

| Item | PSC Account# | Amount |
|---|---|---|
| Reservoir | 312 | $5,010,000 |
| Building and Site Work | 321 | 340,000 |
| Piping | 325 | 150,000 |
| TOTAL:* | | $5,500,000 |

*All costs include engineering, administration and contingency

## PROPOSED PROJECT FUNDING SOURCE – CITY UTILITY FUNDS

Proposed Method of Financing the Project – The project will be financed through revenue bonds.

## ESTIMATE OF ANNUAL OPERATING COSTS

### 650 Maintenance of Distribution Reservoirs and Standpipes

The Estimated Annual Operating Costs – The annual operating cost annualized over the course of 20 years is estimated to be $50,000 per year. The operating costs will primarily include painting and some minor equipment and piping repairs.

## PERMITS REQUIRED

WDNR – Water Tower Facility

FAA – Determination of No Impact to Air Navigation

Dane County Board of Adjustment – Zoning Variance to Height Limitation

City of Madison – Building Permit

City of Madison – Conditional Use Permit

City of Madison – Storm Water Permit